

- 1 -

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Takayuki ARAKI et al

Group Art Unit: 1795

Serial Number: 10/579,855

Examiner: JOHNSON, CONNIE P

Filed: May 17, 2006

For: METHOD OF FORMING LAMINATED RESIST

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner

Washington, D.C. 20231

Sir,

Tsunco YAMASHITA, citizen of Japan, duly deposes and says:

1. That he has graduated from the Department of Science of Kochi University, Japan, in the year of 1987;
2. That he was employed in his capacity since 1987 by DAIKIN INDUSTRIES, LTD.;
3. That he has been engaged in research and development on preparation of fluorinated compounds, polymers and resist materials;
4. That he has read and is familiar with the instant application for United States Letters Patent and the Office Action thereto mailed June 23, 2009;
5. That he experimented and proved that a fluorine-containing polymer satisfying the physical matters mentioned

- 2 -

in Claim 1 of USSN 10/579,855, particularly having the number of moles of the hydrophilic group COOH in 100 g of the fluorine-containing polymer of 0.147 can give excellent properties such as solubility to water and various alcoholic solvents, low refractive index and transparency, together with dissolution rate in developing solution.

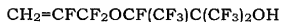
## EXPERIMENTAL AND RESULTS

### EXPERIMENTAL EXAMPLE A

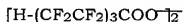
Polymerization reaction and post-treatment of PREPARATION EXAMPLE A were carried out in the same manner as in Preparation Example 1 of USSN 10/579,855 except that 120.3g (0.47 mole) of perfluoro-(6,6-dihydro-2-trifluoromethyl-3-oxa-5-hexenoic acid):



200.3 g (0.53 mole) of perfluoro-(6,6-dihydro-2,3-bistrifluoromethyl-4-oxa-6-hepten-2-ol):



and 300 g of perfluorohexane solution of 8.0 % by mass of:



were used, and 297.6 g of a colorless transparent polymer was obtained.

According to  $^1\text{H-NMR}$ ,  $^{19}\text{F-NMR}$  and IR analyses, the obtained polymer was found to be a fluorine-containing polymer containing a structural unit of the above-mentioned fluorine-containing allyl ether having COOH group and a structural unit of the above-mentioned fluorine-containing allyl ether having OH

- 3 -

group in a molar ratio of 47:53.

Also GPC measurement was carried out after methyl-esterification of carboxyl group in the same manner as in Preparation Example 1 of USSN 10/579,855. The number average molecular weight thereof was 12,000.

With respect to the obtained fluorine-containing polymer, solubility in water and alcohols, pKa value of hydrophilic group, fluorine content, hydrophilic group content (mole/100 g of polymer), Refractive index ( $\lambda = 193$  nm) and Reflectance were measured according to the methods in USSN 10/579,855.

The results are shown in TABLE A together with the results of EXPERIMENTAL EXAMPLE 6 of USSN 10/579,855.

TABLE A

Coating composition	Experimental Example A	Experimental Example 6
Fluorine-containing polymer	Prep. Ex. A	Prep. Ex. 3
Fluorine content (% by mass)	59.3	64.2
Kind of hydrophilic group	COOH	COOH
pKa value of hydrophilic group	3.5	4.0
Hydrophilic group content (mole/100 g of polymer)	0.147	0.135
Concentration of polymer (g/100 ml)	5.0	5.0
Solubility		
Water	○	×
Methanol	○	×
Ethanol	○	×
Isopropanol	○	×
Refractive index ( $\lambda = 193 \text{ nm}$ )	1.44	1.38
Dissolution rate in a developing solution (nm/sec)	300	Insoluble
Reflectance (%)	1.56	—

## DISCUSSION

The results of EXPERIMENTAL EXAMPLE a compared with those of EXPERIMENTAL EXAMPLE 6 prove that the number of moles of the hydrophilic group COOH in 100 g of the fluorine-containing polymer of 0.140 is critical.

- 5 -

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 20 day of October, 2009

by Tsunao Yamashita  
Tsunao YAMASHITA

2) We, the undersigned witnesses, hereby acknowledge that Tsunao YAMASHITA is personally known to us and did execute the foregoing Declaration in our presence on:

Date: 10/20/2009      Witness Tetsuhiko Kodani

Date: 10/20/2009      Witness Yuzo Komatsu